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MARKET SEGMENTATION IN A "TECHNOLOGY PUSH" ENVIRONMENT

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## INTRODUCTION

In the introduction of new products, Philip Morris has successfully adopted what may be called "market pull" product development. There has been some recent interest in evaluating an additional strategy, "technology push" product development, for introducing novel products. The purpose of this paper is to provide a basis for understanding an essential marketing component to both of these approaches--market segmentation.

The differences between "market pull" and "technology push" concepts can be quickly described. Market pull marketing or product development takes a consumer want or perceived need and then develops a product to meet that need. In technology push development, a product or technology is developed and then a market is hopefully created for that product. The advantage of market pull development is that demand may already exist for a product once it is created. This may not be true for a technology push product. The disadvantage of market pull development is that the products developed may not be very sophisticated or creative. (Market pull development might have continued to develop better slide rules while technology push development resulted in the hand held calculator.) Consumers are unable to be creative in expressing their wants or needs. Technology push tries to solve this by developing the advanced technology or products and then finding the customers for them. Interest in technology push development at Philip Morris has been generated by Dr. D. Ennis (memos dated February 7, 1983, May 11, 1983, and June 7, 1983). The biggest fear in following a total market pull philosophy is that a company will become technologically complacent, unable to respond to changes in the market if preempted by a competitor (Riesz, 1980; McIntyre, 1982). With these concerns in mind, market segmentation will be described.

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This paper will be divided into four major areas. The first section will cover various segmentation methods and how they may relate to cigarette segmentation. The second section will cover segmentation analysis--how information is gathered and analyzed, including descriptions of segmentation models. The third section will cover various marketing models which are used for things besides segmentation--new product development and long run brand share prediction, for instance. The final section will be an annotated bibliography. Sources cited in the body of the report are listed in this bibliography, although not every entry is annotated.

The amount of information in the literature on market segmentation and market modeling is voluminous. Assimilation of every single book and article would be difficult for the casual reader to accomplish. Wind (1978) is a good general article on segmentation which could possibly be read prior to any intensive research into specific segmentation areas. Myers and Tauber (1977) and Wilkie and Cohen (1977) also provide good reviews of segmentation research. Barnett (1969) and Yankelovich (1964) are early articles on the topic.

Not many articles have been written specifically about segmentation and the cigarette market. Vitz and Johnston (1965) related a smoker's image of himself to the image of his cigarette brand. Fry (1971) related various personality variables to brand choice. Mazis, et al. (1975) briefly dealt with cigarette smoker's beliefs. Other studies may have been done in the cigarette industry over the years and have not been published due to the nature of the study.

The initial premise in segmenting a market is that segments actually do exist. In other words, the assumption is that the market is not entirely homogeneous.

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Market segmentation is done for two major reasons: 1) to look for new product opportunities or areas which may be receptive to current product repositioning and 2) to create improved advertising messages by gaining a better understanding of one's customers.

One fallacy often made in attempting to segment a market is that of trying to achieve total segmentation. In other words, trying to segment the entire market according to the variables being considered. This may be possible using some variables, especially demographic ones, but it is not usually necessary. A person with a product to sell and faced with an unknown market need not be able to identify all of the segments who will not buy his product, only the one group that appears to desire/need it. This is done at Philip Morris as well. We are concerned with learning about the smoking population. Not nearly as much attention is paid to the larger segment of nonsmokers.

It is possible to segment a market in many ways. Some may not provide any useful information however. According to Kotler (1980), useful segments must possess the following characteristics: measurability, accessibility, and substantiality. A segment must be easy to measure in order to determine its size, location, and content. It might prove quite difficult to accurately measure the size of the Hispanic, illegal alien market for example. Segments must be accessible through some kind of marketing vehicle; if they are not, how can one communicate the relative benefits of one's product to that segment? Finally, the segment must be of substantial size to warrant attention. Kotler says that "a segment should be the largest possible homogeneous group of buyers that it pays to go after with a specially designed marketing program." (pp. 308-9) Segments can be perceived as opportunities. A company with limited resources needs to pick only the best opportunities to pursue.

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## BASES FOR MARKET SEGMENTATION

There is no one correct way to segment a market. Often several segmentations will meet Kotler's criteria. He divides market segmentation variables into four major areas; geographic, demographic, psychographic, and behavioristic. Each of these will be discussed. A fifth area involving image segmentation will be covered as will some miscellaneous bases.

### Geographic Segmentation

Geographic segmentation is the simplest area to understand. When a market is segmented geographically, one is saying that consumer needs or the ways to fill those needs vary geographically. This can mean by region of a country, population density, or climate. Consumers in the Southeast use more vegetable shortening than any other part of the U.S. Northeastern and Midwestern regions have more small beer breweries than any other region, hence more locally unique segments. The consumption of menthol cigarettes is greater in the Southeast than in any other region of the country. Hawkins, Roupe, and Coney (1980) discuss geographic subcultures.

### Demographic Segmentation

Demographic segmentation appears to be the most prevalent form of market segmentation. This is probably because consumers are placed on definite scales of measurement which are easily understood. The information is easily interpreted, easily gathered, and easily transferable from one study to another.

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Common demographic variables are age, sex, size and type of family, income, educational level, race, and nationality. Combinations of these variables are sometimes used depending on the degree of specificity required in the segment construction. Cigarette users are often described in demographic terms. Some examples of demographic segmentation reflected in consumer products are Virginia Slims--marketed toward women, Life Stage vitamins--four types depending on age and sex, and disposable diapers--age of infant. The Cigarette Tracking Studies provide a lot of annual demographic information about the cigarette industry. Demographic information is provided for all brands. Historical data (3 years) is provided for PM and major non-PM brands. Historical demographic data is also provided for the entire market. This type of information will be very valuable in designing and analyzing segmentation studies. Most marketing studies collect demographic information as an addition to any other variables being studied.

Over the years the validity of using demographic variables in segmentation studies has been supported. Bass, Tigert, and Lonsdale (1968) make good use of demographics in describing light and heavy users. Blattberg, Peacock, and Sen (1976) state that "buyer behavior may be ...closely related to GENERAL characteristics of the household, such as demographics...." (p.154) Frank, Massy, and Wind (1972) discuss various demographic characteristics and their use in market segmentation (pp. 2942). Some of the problems that researchers seem to have with demographics stem from their attempts to segment entire markets. Demographics will not be good descriptors of segments if the segments do not clearly exist. As was stated earlier, it may not be possible to completely segment a market, but that is acceptable if some segments can be clearly identified. Demographics often prove to be a good way to describe these identified segments.

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### Psychographic Segmentation

Psychographic or life style segmentation becomes a little more difficult to explain in that one is no longer looking at clearly definable, quantitative measures, but is beginning to investigate such things as social class and way of living. Wells (1975) called psychographics a quantitative attempt to place consumers on psychological dimensions. Ziff (1971) states that attempts to narrowly define psychographics have proven difficult. Ziff looks at psychographics as a way to segment the over-the-counter drug market. Four segments are developed and described based on their health concerns.

Psychographics can serve as the next step in research if a demographic study produces no clear or actionable segments. Basically when one uses psychographics in an attempt to segment a market, one is trying to incorporate part of the inner person into the understanding of that market. Rather than being concerned solely with age, sex, or marital status, personality characteristics, values and beliefs, and life style are considered. For example, the following could serve as possible descriptions of a brand's smoker group:

- 1) Demographic--older, more highly educated males who tend to make over \$20,000 a year.
- 2) Psychographic--sophisticated males who are concerned about their health; masculine, but in an upscale, more affluent way; confident.

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The psychographic description looks at the inner person rather than the outward expression of the person.

Psychographic segmentation is often called life style segmentation. No one set of life styles exists, but in general terms fairly finite groupings are not difficult to develop. This type of research analyzes consumers first and then applies the product to them in hopes of discovering different usage patterns. Life style segments are usually derived by submitting a questionnaire to a random sample of people. In PED one might want to look at smokers vs. nonsmokers or one brand against another. The questionnaire would ask for levels of agreement to statements about everyday living such as "I keep my house very clean" or "I shop at several stores before buying a dress." From answers to these statements segments can be derived through cluster analysis or other form of multivariate analysis. Description of the segments or clusters is left to the researcher. This could cause problems if the researcher is not especially knowledgeable about the market in question, since improper descriptions could be assigned to the clusters.

Plummer (1974) discusses life style segmentation and finds that it does a better job in describing segments than demographics alone. Plummer's justification for life style segmentation is simple enough. He states that "the basic premise of life style research is that the more you know and understand about your customers the more effectively you can communicate and market to them." (p.33) He views life style segmentation as a combination of demographics and psychographics. Loudon and Della Bitta (1979) give several examples of how new products were positioned successfully using information from life style segmentation studies.

Wells has conducted a lot of research into psychographics. Wells and Tigert (1971) show how psychographics (activities, interests, and opinions) can describe target audiences and product users. Wells's (1974) book on psychographics and life style is often cited and covers many general areas on the subject. Wells (1975) is a very good article on the status of psychographic research at that time. He illustrates five different uses of the research method. The eight male psychographic segments (p.201) developed by Wells are often found in other articles. These include "the quiet family man", "the traditionalist", and "the he-man". Each is described based on their psychographic characteristics. While, with the exception of Boote (1981 and 1982/3) and Bernstein (1978), recent published work on psychographics could not be located, the method is not outdated. In fact, it is a segmentation method which could easily be applied to the cigarette market.

#### Behavioristic Segmentation

Kotler's fourth and final group of segmentation variables are behavioristic ones. This includes such areas as purchase occasion, benefits sought, user status, degree of usage, degree of loyalty, readiness stage, and marketing factor sensitivity. In general consumers are segmented based on knowledge of the product, attitude, or response to the product. Much has been written on the various facets of behavioristic segmentation. For instance, Hutt, Muse, and Kegerreis (1972) discuss the behavioral differences in Maverick and VW buyers. McDonald and Goldman (1979) is a good general article concerning behavioural segmentation strategies.

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### **Purchase Occasion Segmentation**

In purchase occasion segmentation consumers are grouped based on the reasons or times they purchase a product. Beer drinkers might be classified as 1) the heavy drinker who tries to escape, 2) social acceptance or accomodation, 3) the one beer drinker when dining out. A beer company would look for a new occasion or use for which beer consumption might be appropriate. Arm & Hammer's novel suggestions for using baking soda are good examples of this. Purchase occasion segmentation may have applications in the cigarette market as well given the social nature of the product. Dickson (1982) discusses person-situation segmentation in the context of other segmentation research.

### **Benefit Segmentation**

Over the past few years, segmentation schemes originally classified as psychographic have expanded into new areas, partially due to the ambiguity in the definition of the original term. Benefit segmentation falls into this category. Benefit segmentation is a method of dividing up a market based on the benefits derived from or desired in a product, such as economy, convenience, or prestige. In cigarettes this might mean that one group of people smoke for the tobacco flavor, another for social acceptance, perhaps another for a cooling menthol sensation, etc. For benefit segmentation to be feasible, each group seeking a different benefit should be different in some way which can be identified and acted upon. One appealing aspect of benefit segmentation is that it does not involve describing a market after the fact. Rather, the aim is to try to determine why a person buys a product and,

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therefore, why similar people might buy the product if the benefit is communicated to them.

Examples of benefit segmentation studies can be found throughout the literature. Some of these are Yankelovich (1964), Haley (1968), Calatone and Sawyer (1978), and Myers (1976). Haley's article was particularly successful in dividing the toothpaste market into benefit segments. Myers and Tauber (1977) devote a chapter to benefit structure analysis and is useful as a general article on the subject. Myers (1976) sees benefit structure analysis as a method of finding new product opportunities in "very broad product/service categories," such as new foods, drinks, etc. An extension of this could be a search for new smoking experiences or new benefits derived from cigarettes.

A benefit segmentation study should attempt to do three things: 1) determine the benefits people look for in a product, 2) the kinds of people looking for each benefit, and 3) the proximity of existing brands to these benefit needs. Perceptual mapping or multidimensional scaling assists in doing this. Product benefits are placed on a map and current product offerings are placed on the same axes. Differences between current products and benefits sought indicate potential for the development of a product which is more desirable than current products. Green (April 1974) provides a good example of this in the sports car market. A couple of problems encountered in benefit segmentation are difficulty in determining benefit group size and semantical variations in stated benefits.

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### Usage Incidence Segmentation

Stout (1977) describes a form of segmentation called usage incidence segmentation which is an extension of benefit segmentation and purchase incidence segmentation. Segments are based on the reasons or occasions a product is used. The attempt is to find out how people are using a product by identifying the "need states" of the consumer. One way to gather this type of information goes beyond free response interviewing. The respondent is given a long list of statements (potential reasons) and asked to mark each one that applies to the question: Why have you used this product (smoked a cigarette) in the last 24 (or 48) hours? One attempts to go beyond the obvious answers to try to find out the true reasons for using the product and therefore the benefits sought or gained.

### User Status Segmentation

User status segmentation divides consumers according to their use of a product (but not the amount of the product they use). Consumers may be nonusers, ex-users, potential users, first-time users, and regular users. Marketing messages will be different depending on the segment one is tailoring the message toward. An advertisement to a nonuser would probably be informational and about the product class in general while a regular user might be told of the merits of one product vs. a competitor.

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### Usage Rate Segmentation

Usage rate segmentation is separate from usage status segmentation in that only users are considered. This may be of interest to PED since we are usually concerned with smokers as opposed to nonsmokers. Usage rate segmentation divides consumers into light-, medium-, and heavy-user groups. Heavy users may consume a disproportionately large amount of the total consumption of the product (Loudon and Della Bitta, p. 93). Ideally each group will have some sort of identifiable characteristics to which marketing messages can be targeted. Depending on marketing goals and the relative strength of brands within the usage groups, a company may want to try to build share in the light or heavy groups.

One of the things that makes usage rate segmentation so popular is that many companies can use it and because many market research firms and syndicated services can supply data regarding product usage rates based on several demographic and geographic characteristics. Bass, Tigert, and Lonsdale (1968) used demographic (socioeconomic) variables to describe the differences in light and heavy users of several products.

### Loyalty Status Segmentation

Segmentation by loyalty status is attempted when a firm believes that its really loyal customers have characteristics which are identifiable. If these characteristics were identified, the company can create advertising messages which are addressed to other consumers with the same characteristics. Loyalty status can be determined by purchase diaries and much can be learned about a

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market from them. If a person is loyal to your brand and one other, you can find out which brand it is (e.g. Crest and Colgate) and position your product in some way superior to the competitor. Price and availability of the product must be considered when doing loyalty status segmentation. Frank (1967) did not find loyalty status to be a particularly strong segmentation procedure.

### **Other Behavioristic Bases**

Two other segmentation schemes which Kotler mentions are buyer readiness and marketing factors. Buyer readiness segmentation separates people based on how likely they are to buy a product. Some may be unaware a product exists, some may be eager to buy it. Marketing effort and message will vary depending on the relative size of the groups. Segmentation by marketing factors, such as price, advertising, coupons, etc., groups consumers based on their responsiveness to these various marketing tools (McCann, 1974). This can be helpful to a company in allocating its resources. Neither method seems to be applicable to the cigarette market.

### **Image Segmentation**

Another body of research may be applied to segmentation studies, especially in the cigarette industry. In addition it can provide valuable insights into why consumers make the product choices they do. This area involves consumer's self-image or self-concept and its relationship to the image of the product. Several authors have written articles on the subject (Dolich, 1969; Fry, 1971; Ross, 1971; Ostlund, 1974; Landon, 1974; and Sirgy, 1982) and research is still being conducted in the field. Segmentation based on self-image or self-concept

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does not easily fit into one of Kotler's four categories. It is really a combination of psychographic and behavioristic aspects of the consumer. It really can be considered a fifth area according to Kotler's classification.

To say that the cigarette market can be segmented based on image or self-concept variables, one must look at how cigarettes are currently presented to the public. In other words, what is the marketing message that is being delivered to the consumer. By and large it is a message based on image, product as well as personal. Cigarette brands, especially large ones, each try to differentiate themselves from other brands by having their own distinctive image. Some of these might be the young, female, outdoors-oriented Salem Lights smoker; the western, be-your-own man Marlboro smoker; the no nonsense, flavor conscious Merit smoker; and the elegant, refined, affluent Barclay or B&H Deluxe Ultra Lights smoker. In an ideal sense each brand of cigarettes would appeal to a distinct image or concept segment. With so many brands on the market however, these targeted positionings often become blurred or overlap. For instance, the blue collar image is communicated in Winston, Raleigh, and Chesterfield among others. This phenomenon probably exists for several brand "clusters", i.e. a dominant brand with a well defined image with some smaller brands clustered around trying to exhibit the same image.

Why all this concern with image? Why not just say "Here, we have this cigarette that we make. It's in supermarkets and drugstores. Go buy it."? If there were only a few cigarette brands we could do that. (AT&T did not advertise telephones while it was the only manufacturer of them, only the uses of telephones.) Well over 200 cigarette brands exist however, making the cigarette

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market one of the most diffused consumer products markets in the country. Some form of distinctive feature is needed to get the consumer to consistently choose a product. Distinctive features can be product oriented (the unique "hill holder" clutch in a Subaru), service oriented (private hospital rooms at semi-private rates), or image oriented (the Marlboro man). Image oriented features can be the toughest to describe and create, but once established in the consumer's mind, they can generate years of consumer loyalty.

Only a few cigarette brands have attempted segmentation and positioning based on a distinctive product feature and most of these have been based on filters. The Tareyton charcoal filter and Parliament's recessed filter are good examples. Merit's "enriched flavor" process could be considered a product feature although the physical appearance of the product was not changed. No service featured cigarettes come to mind. Image based cigarettes abound. This may seem wrong to the typical cigarette researcher because he/she can point to many product distinctive features in cigarettes. To understand a consumer's viewpoint one must consider the relationship between the consumer and his/her cigarette. The consumer may not know or care about different flavors, blend mixtures, or filter construction per se. Rather he/she may be looking for such things as good taste, aroma, something to put in a nervous hand, or something to use to project a certain statement about him/herself. If they are dissatisfied with their brand, they may not make a rational evaluation of the other brands available and then pick a new one. Rather they may switch fairly randomly basing their decision on such things as advertising and advice from friends until they find a satisfactory brand. The image a cigarette possesses has an impact on this selection process. —

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Self-concept or image segmentation can be done in many ways. A large body of research has been devoted to these areas and others such as personality traits and product choice (Evans, 1959), ideal self-concept as opposed to self-concept (Landon, 1974), and brand image and self-image similarities (Dolich, 1969). Early studies often had subjects take a standard personality test and then relate the results to some sort of product purchase or usage rate. For instance Vitz and Johnson (1965) use a personality test to show that a correlation exists between masculinity of cigarette smokers and the perceived masculinity of the brand they consumed.

According to Grubb and Grathwohl (1967) this image type of research attempts to "link the psychological construct of an individual's self-concept with the symbolic value of the goods purchased in the marketplace." (p.23) Self-concept is more narrowly defined than personality--being concerned with how a person perceives himself. Goods are symbols which communicate something about the individual to his "significant references." (p.24) For instance, a person may buy conservative clothing not for warmth and protection, but rather for what such attire will say about himself to others.

Dolich (1969) and Landon (1974) discuss two forms of self-concept or self-image. One is the regular self-concept and the other is the ideal self-concept, i.e. how you would like yourself to be. Basically a consumer will purchase goods that either enhance his/her self-image or goods that make the consumer feel closer to his/her ideal self-image. A person may use self-image when buying some products and ideal self-image when buying others. The type of product is often a factor. A person might buy mouthwash based on his/her self-image more than their ideal self-image. Their ideal self-image would not have bad breath.

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Dolich and Landon both found that a relationship exists between self-concept and brand preference. Sirgy's (1982) article is particularly thorough in the areas of self-concept theory and consumer behavior. He discusses much of the work of authors over the years and points to areas where additional work is needed. It is a good article for the interested reader.

One criticism of self-image and self-concept research is that of cause and effect. In other words, if one investigates self-image about a product already purchased, perhaps that consumer's self-image has been altered by the purchase of the product. For instance, suppose an introverted conservative man buys a convertible Chrysler because he got a very good deal on the car. He only bought the car because of the price. If later on he likes the car, his self-image may have changed and if he is then studied, one may find that he perceives himself as being more extroverted because he owns a convertible. A researcher could infer that extroverted people buy convertibles and introverted people do not. For rarely purchased consumer durable goods this is a valid concern. It is not as serious a problem for more frequently purchased consumer products since there are fewer non-image reasons for a person to REGULARLY purchase a good radically different from his/her self-image (other than the fact that no product currently available meets his/her self-image).

Another criticism brought out in DeLozier and Tillman (1972) is that most researchers use products with which respondents are already familiar. They argue that for the sake of consistency with self-image, consumers gravitate toward brands which more closely resemble their self-image. A researcher seeing the result of this could predict too strong a relationship. They used brands

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unfamiliar to the subjects yet still found the self-image measures to be useful in predicting brand choice.

Although specific suggestions for research that PED can do will be presented later, some general comments seem appropriate here. While increased knowledge of the relationship between self-concept and purchase intention is desirable, such work should probably be left to academicians. It is important for us to understand how smokers relate the image of the brand they smoke to their own image of themselves. Knowing the image the cigarette brand has in the consumer's mind is important in and of itself. One example of the type of research PED could do using the current POL panel would be something similar to what Dolich (1969) did. A questionnaire could be sent out to a variety of smokers asking them to rate on a seven or nine point scale how they perceived different brands on some image criteria such as masculinity/femininity, sophistication, and independence. Many other image criteria could be put on the questionnaire as well. After evaluating several brands, the respondents would rate themselves (and maybe their ideal self-image) on the same dimensions. The brand they smoke would also be rated. The brand seen as closest to their image of themselves could be identified and compared to the brand they currently smoke. Some brands may more closely match the smoker's self-concept than others. Marketing and new product opportunities could exist where a smoker's self-image and brand image do not match very well.

Multidimensional scaling, which will be discussed later, can also be used to show the differences between self-images and brand images. Respondents could be asked questions similar to the above study and maps could be created showing these differences. A Winston smoker could be asked how he ranks various brands

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based on masculinity/femininity, degree of sophistication, and independence. He would then rate himself on the same dimensions. Canned computer programs could create composite maps for each brand's smokers. Again marketing and new product opportunities could exist where differences in a smoker's self-image and the image of his brand exist. Information could be gathered on one questionnaire for more than two dimensions and these could be compared on different maps.

### Miscellaneous Bases

#### **Brand Clustering**

Another form of segmentation not covered yet is segmentation by brand clustering or brand grouping. This is separate from the brand image clustering mentioned earlier. Brand clustering refers to a concept that similar people will purchase similar types or groups of products. An extension of the theory is that people who purchase the same products engage in similar activities and have similar interests. (Hopefully, beyond the obvious such as people who purchase shotgun ammunition tend to go hunting.) If one could identify a profile of consumption and/or activity for, say, B&H smokers and smokers of non-Philip Morris brands one could possibly find a brand that is vulnerable to penetration by B&H. This could be accomplished by incorporating activities associated with the similar product consumption patterns into advertising.

Such a study could be conducted using the POL panels in the following manner. Panel members of various brands would be sent a questionnaire which would solicit information on level of consumption of or participation in certain goods or activities. We might find that Camel smokers drink more Schlitz beer than

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other smokers or that Newport smokers water ski more. Responses would be kept anonymous in hopes of gaining better information on image/related goods and activities, if any were asked. Much time would be spent on questionnaire design to ensure a good composite of each smoker group. Analysis of the data could be complicated due to the number of questions but multivariate analysis could be used to simplify the data and form useful clusters of consumers.

A corollary to the brand clustering concept is one of buying a product to round out a set of products, i.e. buying a product based on other products already owned. The practice can be seen for goods such as liquors, records, magazines, and sometimes cars. According to Wind (1977) marketing activities for these products must take this type of purchase determinant into account. McAlister (1979) agrees with Wind and states that for some products a dependence among selections does occur. He suggests a lottery model which incorporates this dependence into the determination of consumer choice. Cigarettes are not purchased in this manner so we should not concern ourselves with the theory to any great extent.

### Product Feature Segmentation

Certain segmentation schemes that have been used in the cigarette industry in the past should perhaps be reevaluated at this time. Two bases come to mind: product feature segmentation and health segmentation. Product feature segmentation has revolved for the most part around filter innovation (Doral's chambered filter, Parliament and Lark) and blend innovation (Merit's "Enriched Flavor" process, all-natural Real). Product feature segmentation involves

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creating an innovation and then developing a segment which uses the product at least partially because of the innovation. Unless the innovation cannot be imitated, the segment will begin to break down as soon as competitors introduce their own versions of the innovation. Since no cigarette innovations which are obvious to the CONSUMER have occurred in the last few years, this type of segmentation may not be relevant at this time. New innovations could certainly change this situation however. R&D at Philip Morris is currently working on several projects that can be considered true product feature innovations which deliver definite benefits to the consumer. The evolution of product feature segments based on these innovations is possible.

### Health Segmentation

Health segmentation has existed for some time as well. It could best be described as segments based on some health concerns with smoking. The segments would be based on tar and nicotine level classifications, as well as perhaps the presence of menthol. Philip Morris's use of this segmentation may be seen in the way to which different groups of cigarettes are referred (ultra low tar, low tar, full flavor). Since a large appeal of segmenting a market has to do with finding a segment that is currently not being adequately served, health segmentation variables may be exhausted. There are currently a variety of brands in every health segment classification. Both of these segmentation methods may be useful again in the future, but not until new products are developed which could create new segments in these areas.

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### Other Comments

In all this discussion about different ways to segment markets, little has been said about the nature of the segments themselves. Each time we refer to segments, we mean a group of consumers in the market who can be described based on the variables being used. They can be users or nonusers, heavy or light users. But they must exhibit some sort of common characteristic which makes them distinguishable from the rest of the market. Another feature of these segments is that they are not static. Most of the studies mentioned so far refer to a one-time segmentation study. This is useful in providing a snapshot of the structure of a market, but not how it is changing. Segments are not static and should not be studied as such. Weinberg (1973) found that while distinct market segments can exist (and, in fact, do exist for new product classes), they eventually break down over time. This breakdown is caused by competitive factors such as the entry of new brands. Competitive actions designed to introduce trial of their brands can also erode distinct segments. The home computer market is an example of this type of segment erosion.

Calatone and Sawyer (1978) found that benefit segments showed some stability over a two-year period, but a fair amount of individual switching among segments did occur. Ongoing segmentation studies prove to be more valuable than one-time shots in that trends can be discerned and new segments recognized (or dissatisfaction with current segments) as they are developing. For example, the benefit of the Cigarette Tracking Studies is enhanced due to the fact that they are annual reports. Any segmentation research considered by PED should be evaluated on its ability to be conducted over time.

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The commonly used bases for segmentation research have now been identified and discussed. Some are currently being used in the cigarette industry, a few are not appropriate to use. One question that may come to mind is how is the information gathered in order to classify a market into segments? Usually the raw data is gathered through some form of mail or hand delivered questionnaire. Some segmentation models require sorting or other form of one-on-one interviewing. Usually marketing research services or consultants can handle the entire study, from panel selection to final data analysis. This can get quite expensive, however. The existence of the POL panels and the computer capabilities at R&D should serve to reduce this expense if outside services are utilized. PED's capability for organizing and conducting focus groups will be important in the design of segmentation studies and questionnaire preparation.

The typical questionnaire will seek the following types of information. Demographic data such as age, sex, education and income are almost always needed. Consumption information about the product/service being studied is usually crucial. This information is usually about usage rates, methods of use, activities where the product is used, amount of use, and why the product is used. For some products this may be all the information that is needed. Much more can be asked of the respondent, however. As mentioned earlier, psychographic studies may ask for a respondent's agreement with certain statements about people in general or themselves in particular. These may be statements about general life style (I like to invite people over rather than go out) or they can be product class specific (I serve chicken more often than beef). Product specific questions fall into the grey area between psychographics and brand image studies. Even so, these questions can be asked as well.

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The existence of the POL panels increases the chances of PED conducting valid cigarette segmentation studies. This is true for several reasons: 1) The panels represent a cross-section of smokers of all ages, sex, tar levels, and PM and non-PM brand smokers; 2) studies can be sent to smokers of small brands relatively cheaply and efficiently; 3) the panelists are accustomed to filling out questionnaires; and 4) they are familiar with the Product Opinion Laboratory. All of these factors will serve to increase response rates and help to insure that high quality data is gathered. Additionally, several members of PED have experience in questionnaire design, data interpretation, and computer analysis of the information.

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## SEGMENTATION ANALYSIS AND MODELS

### Introduction

Beyond the simple questionnaire-type format for gathering information, several other methods and modeling techniques have been developed to assist in market segmentation and market modeling. Some of the methods do utilize questionnaires or purchase diaries while others require more complicated forms of data collection. The methods to be covered include Automatic Interaction Detector (AID) and its multivariate counterpart, conjoint analysis and its extensions, multidimensional scaling (MDS), and canonical analysis. Several specific models will also be described which attempt to do such things as predict test market results, position new products, and predict new product sales. Each method will be described along with references for further research. While some of these may not be specifically appropriate for market segmentation studies, they will help provide information on market structure and new product introduction into markets, issues which are associated with market segmentation and "technology push" product development.

The purpose of this section is not to educate the reader on every minute detail of each analytical technique. Rather the attempt is to present each technique in general terms along with multiple references for further research. Where feasible each technique's discussion will end with a brief summary. Some sections will cover general concepts and areas of research, others will be on models which have been developed for a specific purpose. Some techniques will be found to have great promise in cigarette segmentation research, others will be useful in product positioning or new product development.

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Before each specific technique is covered, some general sources should be cited. With the exception of AID, Sheth (January 1971) provides a good discussion of multivariate techniques. The first few pages of Green, Halbert, and Robinson (1966) are also good. Green and Tull (1978), Myers and Tauber (1977), and Urban and Hauser (1980) are texts which will be cited frequently.

### AID and MAID

Automatic Interaction Detector (AID) is a technique which produces an output which is simple to interpret and to communicate to managers (Assael, 1970). The output is a tree-like diagram which successively splits a sample based on the degree of variance explained by the independent variables. The method was developed by J.A. Sonquist and J.N. Morgan in 1964. AID starts with a single dependent variable and then systematically goes through the independent variables looking for those characteristics which do the best job in explaining the variation in the dependent variable. The most important predictor is named first (the first split in the tree) and the process is repeated again and again until user-imposed constraints are reached or the variables remaining do not improve predictive accuracy.

AID is found to be a powerful tool for identifying non-linearities and interactions which may be present in data. Frank, Massy, and Wind (1972) find that AID "performs an extremely large number of dummy variable regressions which test for non-linearities and/or interactions without the requirement that the analyst on an a priori basis specify either the model to be tested or the corresponding transformations required of the independent variables." (p.147)

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AID is similar to stepwise multiple regression techniques except that in stepwise multiple regression the researcher must specify the non-linearities, among other things, being considered.

AID also has some drawbacks which may inhibit its use in some situations. Doyle and Fenwick (1975) cover several of these such as sample size, inter-correlated predictors, noise, and stopping rules. Sample size is an often mentioned criticism. Since the sample is successively split into ever smaller groups, a large initial sample is needed. According to Doyle and Fenwick as many as 2000 respondents may be needed. AID does not take into account any inter-correlations among independent variables. In other words, once a variable is split off, any other variables correlated with it are less likely to be chosen. Noise in the data may create tree instability. Different samples from the same population may result in different trees. A fine line must be walked when determining stopping rules. If the tree is stopped too soon, important variables may be left out. If the rules are not strong enough, the problems with noise (inability to duplicate results) will increase.

Several commercial studies utilizing AID have been reported in the literature. An early application is described by Assael (1970). Assael and Roscoe (1976) discuss a study of long distance telephone usage done by AT&T. Martin and Wright (1974) describe a study of women consumers in retail markets and compare the study with a different tree diagram based study. Green and Tull (1978) give the results of a study of car quality and probability of remaining "make loyal." AID is basically recommended as an initial screening procedure to identify variables which may be important. They can then be analyzed by other multivariate techniques. It is commonly suggested that AID not be used by itself in segmentation work.

Multivariate AID (MAID) is similar to AID except that more than one dependent variable can be used at a time. Assael and Roscoe (1976) used AID for segmentation using one dependent variable and canonical analysis for more than one. MacLachlan and Johansson (1981) suggest that MAID be used instead of canonical analysis for multivariable segmentation. Gillo and Shelly (1974) pioneered work in this area. The Gillo (197?) booklet is also dedicated to the topic. MAID suffers from many of the same problems listed above for AID. MacLachlan and Johansson offer solutions to some of these problems. The number of published studies using MAID are considerably fewer than those using AID. This is probably due to the fact that MAID is a newer technique.

To summarize, AID has been used in several studies and its chief advantage is the simplicity of the model's output. It is easy to interpret and explain to others. It should not be used alone, but rather as an initial screening method to identify variables which should be analyzed by other techniques. MAID is the multivariate extension of AID. Both techniques suffer from the same shortcomings.

### Canonical Analysis

As mentioned earlier, canonical analysis, or canonical correlation, can be used where there are multiple dependent variables. It can provide insight into the way two sets of data are interrelated. For instance, consider a study of hand mixers. Consumers might group product attributes such as number of speeds, weight, length of cord, detachable beaters, etc. They also might group companies together such as GE, Oster, Hamilton Beach, and any number of private brands. These might be rated on quality, image, service, warranty, reputation, etc. Canonical analysis can indicate relationships between these sets of data. An additional set of demographic data could also be added.

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Hotelling (1935) first developed the method almost fifty years ago to deal with relating two sets of variables measured across the same group of respondents. Even though canonical analysis has existed for some time, its use in market segmentation studies has been limited. According to Myers and Tauber, canonical analysis can relate two or more sets of variables, gathered from the same group of respondents, "in both a clustering and predictive way." (p.84) Other multivariate techniques may do one or the other, but not both.

A question arises as to whether or not segments derived from a canonical analysis are segments in the normal sense of the word. From a technical standpoint the groups may not be segments in that they may not represent similar groups of people. They are really only groups of response patterns which can be predicted using a linear combination of variables derived from a questionnaire. Different segments could be derived from other segmentation techniques. However, the segments derived are actionable from a managerial standpoint. The segments represent response patterns such as amount of a product used and important consumer characteristics, which can be described by the manager in terms of demographics, and media usage. These "segments" can be reached. A cluster analysis might reveal discrete segments, but not how to communicate with them. Myers and Tauber state that canonical analysis can be very helpful in market structure analysis even though it is not a technically perfect tool for market segmentation.

Green, Halbert, and Robinson (1966) provide a step-by-step comparison of several multivariate techniques including canonical analysis. They claim that canonical analysis may be viewed geometrically "...as a measure of the extent to which a group of individuals occupies the same relative position in the space spanned by



the predictor (independent) variables." (p.33) They also mention two limitations of the technique: 1) both sets of variables must be interval scaled, and 2) the observed data must be randomly drawn from the same multinormal universe. Green and Tull (1978) describe canonical correlation as dealing with "...both description and statistical inference of a data matrix partitioned into at least two criteria and at least two predictors where all variables are interval-scaled and the relationships are assumed to be linear." (p.410)

Three additional articles provide insights into using canonical analysis. Alpert and Peterson (1972) are concerned with the proper interpretation of analysis results especially concerning the description of relationships between variables. Four points are mentioned for consideration: 1) coefficients reflect shared variation in linear composites of variables, not the variables themselves, 2) canonical weights and canonical correlations must be considered during interpretations, 3) each pair of canonical variables is independent from other pairs, and 4) determination of inclusion cut-off points depends on the purpose of the analysis. One must be careful not to twist the data to fit one's research goals by manipulating these cut-off points.

Fornell (1978) looks at three forms of canonical analysis: correlation, variate, and regression. Canonical correlation analysis is by and large what we have discussed so far. Canonical variate analysis looks at the "within-structure" of the variates. The process is similar to factor analysis in reducing the number of variables studied. Canonical regression analysis is similar to ordinary regression except that the dependent variable is multidimensional. The dependent variable used is a linear combination of observed dependent variables.

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Lambert and Durand (1975) provide us with potential shortcomings in using canonical analysis. They focus on three in particular: 1) shared variance, 2) weight instability, and 3) construct interpretations. Shared variance is the amount of variance which is present in both sets of variables, i.e. the intersection of the variables. Canonical analysis does not identify the amount of shared variance present. Weight instability can be increased due to multicollinearity among the variables. Creation of subsets from the original sets of variables may cause problems since the subsets may lead one to make false interpretations. Nevertheless, canonical analysis is found to be useful in showing overall relationships among criteria and predictor variables, especially if little knowledge exists about the relationships beforehand.

Some of the other articles utilizing canonical analysis are the following. Alpert (1972) used the technique to study the impact of personality in market segmentation. Farley and Ring (1974) discuss the technique in conjunction with buyer behavior. Frank and Strain (1972) used canonical correlation analysis to determine the relative importance of variables as predictors of purchase behavior. Sparks and Tucker (1971) investigated the relationship of personality traits and product use patterns.

In conclusion, canonical analysis is a multivariate method which is able to show the relationships between more than one SET of variables. Most studies have used two sets although more than two can be used. The technique has not been used as much as other techniques in marketing segmentation projects. It is a technique which is especially useful when little is known about a market and consequently, variables cannot be intuitively eliminated from a study.

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### Cluster Analysis

Cluster analysis is used extensively in numerical taxonomy (Sokal and Sneath, 1963). The usual objective of a cluster analysis is to separate objects, respondents, whatever, into groups such that homogeneity is maximized within the groups and heterogeneity is maximized between the groups. Objects are classified into only one group and members of a group are generally assumed to be indistinguishable from one another. One of the unique features of cluster analysis is that there is no preassignment of respondents into categories.

Myers and Tauber (1977) find that cluster analysis is an effective segmentation technique. They divide cluster analysis into two main areas: hierarchical clustering and partition clustering (p.77). Hierarchical clustering is used more often for segmentation projects. Clusters are created in a stepwise fashion, each larger cluster becoming less and less homogeneous. Green, Wind, and Jain (1973) provide a good example of this type of clustering. In partition clustering, the number of clusters are determined by the researcher before the analysis begins. The goals of within group homogeneity and between-group heterogeneity are then maximized by the algorithm being used. The number of clusters designated depends on the type of study. Each cluster generated can be considered to be a segment. Myers and Tauber find cluster analysis to be superior to factor analysis for market segmentation.

According to Green and Tull (1978), the researcher makes the initial assumption that clusters in the data do exist, i.e. the data is not entirely homogeneous. Several pages (pp.440-55) of their book are devoted to cluster analysis and its applications. They classify clustering techniques in much the same way that Myers and Tauber do although they refer to partition clustering as

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nonhierarchical and then divide it into three subgroups (p.446). Descriptions of the clusters derived in a study are usually based on the centroid or average value of the cluster. Statistical reliability is found to be hard to determine yet this should not limit the use of the method. Green and Tull also provide some commercial applications of cluster analysis.

Worcester and Downham (1978) state that cluster analysis has been used mainly to cluster people (PRIZM for example), but it is by no means limited to this. The variables that the groups are being clustered on are usually characteristics which describe the consumer (attitudes, needs, demographics, etc.). Behavioral and brand image information should probably not be used in cluster analysis (W&D p.360). Clusters may change over time and this should be considered when making decisions based on a cluster analysis study.

Several articles have been written on the subject of cluster analysis or have used the technique in a marketing study. Punj and Stewart (1983) provide a good review of the technique. Lessig and Tollefson (1971) have written a particularly good article which describes a cluster study used to identify consumers likely to respond similarly to marketing stimuli. A relationship between buying behavior and personal characteristics was also investigated. Doyle and Hutchinson (1976) find cluster analysis to be superior to AID and regression analysis for market segmentation. Peterson (1974) found that cluster analysis was an effective tool for market structuring. It described AID as a part of cluster analysis. Arabie, et al. (1981) introduce a new type of cluster analysis by no longer requiring that objects belong to only one cluster, i.e. clusters can overlap or intersect in some way. This type of clustering might be useful to PED given the complicated nature of the cigarette smoker. He/she may simultaneously belong to more than one cluster based on the dimensions being studied. The ADCLUS model described by Arabie, et al., attempts to incorporate

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this condition into the clustering technique. The result of this type of research could be to develop several target segments of consumers, each different yet all of which share a common characteristic.

An often cited use of cluster analysis is the determination of test market locations. This is seen in Day and Heeler (1971) and Christopher (1969), and Green, Frank, and Robinson (1967). Other articles on cluster analysis include Funkhouser (1983), Klastorin (1983), Ritchie (1976), and Shepard and Arabie (1979).

Cluster analysis has had many uses in the field of market segmentation and will continue to be utilized. It is found to be superior to AID and factor analysis in segmenting markets. The goal of cluster analysis is to create homogeneous clusters of consumers or products which are as different as possible from each other. The technique can be combined with other analysis methods (such as MDS), if necessary.

### Factor Analysis

Factor analysis is a technique which has already seen extensive use in PED. Consequently, detailed explanation of the concept here would be redundant. Factor analysis is often used for data reduction or summarization. The researcher uses one of many factor analysis techniques to look at the degree of association among all of the variables, factor analysis is not concerned with dividing the data into dependent and independent sets. Factor analysis can be used in market segmentation as it has been used in POL studies. Green and Tull (1978) show how the technique can be employed in an image study of

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"noncustomers." (p.421) This type of research could easily be adopted to an image segmentation study of smokers using the 7-point scales that the POL panelists are familiar with.

Green and Tull devote several pages to factor analysis and a specific technique-principal-components analysis (pp. 418-39). Chapter Four of the Myers and Tauber book is also devoted to factor analysis, although in the context of product positioning. Cooper (1983) provides a good technical review of the technique. The technique is also found to be adaptable to metric multidimensional scaling (and nonmetric scaling techniques) which will be described shortly (MacCullun, 1974). Hauser and Koppleman (1979) find that factor analysis is a superior predictive tool when compared to discriminant analysis and similarity scaling.

According to Green, Halbert, and Robinson (1966) factor analysis is concerned with "reducing a set of observed relationships...to a smaller, more parsimonious set of variables which can be used to reproduce the original set of intercorrelations with little loss of information." (p.33) Myers and Tauber simplify it even more by saying that factor analysis "...simply performs an exercise in semantics by identifying groups of similar statements." (p.42) One thing the researcher must be wary of is in naming these smaller sets of variables or statements. Factor analysis does not provide these names. The researcher must be sure that his/her description of these sets fits with the larger set of variables from which the consolidated sets were obtained.

Other articles on the subject include these two: Ekeblad and Stasch (1967)--a general article on the technique and Heeler, Whipple, and Hustad (1977)--

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describes a factor analysis study of attitudes. Urban and Hauser (1980) discuss the use of factor analysis in producing perceptual maps (pp. 195-212, 216-7).

To summarize, factor analysis is currently used by PED in POL studies. The concept can also be applied to the areas of market segmentation and product positioning as is illustrated by several articles.

### Regression Analysis

Regression analysis has been extensively used in marketing research. Often its use has been to predict demand or sales of a product at some point in the future. Simple regression involves determining a linear relationship between an independent variable and a measured response. For instance, the amount of snowfall in Minnesota may be used to predict the demand for snow blowers in the state for that year or the next. Multiple regression involves the use of several variables to predict the level of the dependent variable. Extending the above example, the demand for snow blowers in 1983 could be a function of snowfall in 1982, advertising in 1982, unemployment in 1983, and predicted snowfall for 1983. Any number of variables could be incorporated into the regression equation, although some variables may have more predictive power than others. Similar equations could possibly be constructed for prediction of cigarette demand using historical data and relevant current data.

The concept of simple and multiple regression as well as excellent descriptions of the technique can be found in several texts. Two of these are Worcester and Downham (1978, pp.325-7) and Green and Tull (1978, pp.303-38). Wildt and McCann

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(1980) describe a regression model which can be used for segmentation research. It attempts to explain variation in consumption data by inserting an "inherent component of randomness" into the model.

### Discriminant Analysis

Discriminant analysis is often described with regression analysis because both techniques attempt to predict something about the dependent variable. In regression analysis some level of consumption is predicted, in discriminant analysis the dependent variable's membership in a class is predicted by whether or not certain conditions apply.

For example, suppose we wanted to classify people as users and nonusers of a product. Depending on the product we might look at such things as age, income, expenditures on substitute or complimentary goods, and attitudes toward a specific thing. By conducting the analysis we might see that respondents that fall into certain categories tend to use the product and others do not. Our marketing plan could be directed toward people who also fall into these categories and who are nonusers. Pool owners might tend to be members of a private club, have teenage children, and be homeowners. Advertisements for pools could incorporate these characteristics into their messages.

Green and Tull (1978) describe discriminant analysis and suggest that the technique can be used to answer questions such as: What are the differences among consumers that are loyal and nonloyal; are the purchasers of competitive products different demographically; and what are the preference patterns of

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different people? Other articles which deal with discriminant analysis include Morrison (1969), Ostlund (1974), Darden and Reynolds (1974), and Bass and Talarzyk (1972).

Discriminant analysis is used widely in marketing research. It is very helpful in learning about the differences in users and nonusers and in identifying certain qualities about users. Morrison states that the most common use of the technique has been in classifying loan seekers as good or bad credit risks. Discriminant analysis may not be the best method available to segment a complex market such as the cigarette market.

### Multidimensional Scaling

Multidimensional scaling (MDS) is a multivariate technique which was originally developed to measure human perceptions and preferences. One of the reasons MDS is popular is similar to that for AID--the output is easy to understand and explain. Usually a variety of products, attitudes, benefits, etc. are graphed on a two dimensional plot based on the degree of similarity between the items as determined by respondents. Respondents might be asked how do these products compare (on a x-point scale) in regards to strength, tobacco flavor, and other sensory parameters. Several product pairs could then be given and the information could be computer analyzed to generate the maps based on these similarity ratings. In addition, respondents can be asked to rank the dimensions so that the most important determinants of purchase behavior can be identified and mapped.

Taylor (1971) presents a fairly simple description of mapping and its use to date in business. It is a good initial article on the subject for the

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interested reader. He states that mapping can fall into two main areas--buyer perception and buyer preference. Buyer perception is illustrated with an often used example--creating a map based on the respondent's estimates of the distances between known points (in this case the state of Michigan). Green and Tull (1978) show a similar example for the entire United States (p.463).

Throughout the literature one finds references to metric MDS and nonmetric MDS. Metric MDS involves mapping using actual or estimated differences. Nonmetric MDS involves mapping using ranked differences. (A and B are two units apart, A and C are three units apart, or A and B are closest, A and C are next closest.)

Green and Tull agree with Taylor in that the true strength of MDS lies not in mapping physical differences, but rather in mapping psychological differences. They illustrate how a respondent's, or group of respondents', preferences can be incorporated into the MDS model. A map can be created which shows each brand as it is perceived by the respondents as well as the respondents' ideal point or most preferred combination of the dimensions mapped. The use of vector models is also discussed (p.471). A vector model is where the dimensions are desired into infinity by the respondent (lowest tar or most tobacco flavor). Johnson (1971) provides a good example of this type of model.

The information needed for an MDS study can be gathered in a variety of ways. Rankings and perceptions can be gained by personal interview and by mail or hand delivered questionnaire. Other analysis techniques can be combined with the scaling as well. Johnson combines a cluster analysis with MDS to show how various beers are perceived and how they compare with the clustered respondents' ideal points. Factor analysis and discriminant analysis have also been used with MDS.

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Green and Tull provide several examples of prior uses of MDS. These include the development of soft drink slogans (similarity between slogan and brand), computer firm images (among users and nonusers), high nutrition cereals, and magazine positioning. In these studies the impact of MDS results on advertising messages can be clearly seen.

MDS can be used in other areas of marketing research as well. Three of these are market segmentation, product positioning, and new product development. Green and Tull suggest that MDS's application to market segmentation can be accomplished by saying that a segment in a MDS study would represent a group of respondents who would have similar ideal points based on the dimensions studied. Johnson's previously cited study from the beer market is an example of this type of segmentation. Being able to describe differences in the clusters demographically would increase the value of the segmentation. Market opportunities would exist where a large cluster of ideal points is not near any current brands. Such a study could possibly be done using various cigarette brands.

MDS can also be used in new product development although conjoint analysis and benefit segmentation are probably better techniques to use. Basically the users of MDS for this purpose try to predict how new products will be accepted based on their position in an already determined perceptual space. This really is not that different from what would normally be called product positioning but Green and Tull choose to make the distinction. Pessemier and Root (1973) use a form of MDS in what they call new product planning.

Urban and Hauser (1980) devote a chapter (19) to perceptual mapping in the context of new and existing products. This seems to be one of the best areas

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for systematic use of MDS. Perceptions of brand positions could be tracked over time as they may migrate depending on ad campaigns and new product offerings. Urban and Hauser also discuss using factor analysis with MDS as well as actually producing a map. Positioning a new product is said to be similar to positioning current products except that consumer reactions and perceptions are based on a concept statement or samples of the product. These authors also present some interesting ways of graphically showing the results of a perceptual map (such as "snake diagrams"). Similarity scaling is also utilized by Urban and Hauser in their perceptual mapping work.

The difference between metric and nonmetric scaling may be difficult to grasp, especially from the definition previously given in this paper. In fact, in many cases the results of metric and nonmetric scaling are found to approximate each other (G&T p.467). Myers and Tauber provide a listing of the advantages and disadvantages of nonmetric scaling which may help to improve clarity. Some of the advantages include the following: ranking of items in terms of preference or similarity is believed to be easier for respondents than having to estimate the amount of difference in the pairs; current computer models can provide a close approximation of the magnitude of these differences from ordinal data; nonmetric studies do not specify criteria in advance, only similarity differences are used. The final map may closely match the original data. Metric data can be used in nonmetric systems by converting similarity ratings into ranks. Different segments can be determined by grouping respondents based on the degree of similarity they perceive in competitive products; these segments can then be mapped separately if this is necessary.

Nonmetric scaling is found to have some problems as well. Respondents may not be able to rank large numbers of comparisons (10 brands would have 45 two-at-a-time combinations). The ease of collecting similarity data may keep the

researcher from looking at the real problems of the study. No indication is made as to how different each ranked object is from the next one (is the difference between cigarettes ranked 1 and 2 the same as between cigarettes ranked 7 and 8?). Some respondents may simply not have the capability to handle the ranking procedure even with one-on-one coaching. More objects are required in nonmetric scaling to get equivalently dimensional maps than in metric scaling. One may have a group of objects that are so different that the value of mapping is diminished (p.36-8). In some studies, where perceived differences are complex, the ability of a panelist to reproduce an MDS map may be difficult. Where possible, MDS studies should be conducted more than once with the same panelists to check reproducibility.

Several additional articles have been written about MDS, metric and nonmetric, as well as perceptual mapping and the use of other analytical techniques with them. These include Neidell (1969), Darden and Reynolds (1974), Green, Wind, and Claycamp (1975), Green (January 1975), Green (February 1975), Hauser and Koppelman (1979), Pessemier (1979), Johnson (1980), Hauser and Simmie (1981), and Dillon, Frederick, and Tangpanichdee (1982).

Multidimensional scaling appears to have applications in studying the cigarette market. Similarities among brands can be investigated and the maps created would be useful in new product positioning or current product repositioning. MDS has been used extensively in PED. Nonmetric MDS has been used in perceptual segmentation of cigarette brand names, in determining interval distances between phrases in the nine-point hedonic scale, in obtaining the sensory dimensions of cigarette blends to obtain sensory/analytical correlations, in mapping perceived differences in odorants (alkanes, pyrazines, and pyridines) to develop structure-activity models, and in comparing the side-stream quality of

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commercial cigarette brands. In house reports include Accession Nos. 76-124, 80-048, and 81-142.

MDS studies, especially when combined with a cluster analysis of respondents, looks promising for cigarette segmentation. Cigarette attributes could also be added to a mapping study to see which brands are perceived as closest to these attributes. By doing this, opportunities for new products could become more apparent.

### Conjoint Analysis

Conjoint analysis is an analytical technique which has been used extensively in marketing. Most conjoint studies have involved new product design, i.e. what features, given price considerations, should be included in a new product or brand offering? Attempts have been made to expand the uses of conjoint analysis and this may be seen directly in POSSE and componential segmentation. Each inject a segmentation feature into the conjoint framework. Dr. Paul Green has done much of the work in this area and his articles will be cited throughout this section.

Urban and Hauser (1980) view conjoint analysis as a natural extension of perceptual mapping. They see it as the new product design step after the mapping has shown a possible position for a new product. Conjoint analysis is viewed as an intermediate design process which can link features to overall product preference or perception. According to these authors, its primary usefulness is in designing physical features into a product. It has been used in other areas, however, such as developing services for banks and transportation companies. The process has also been used in such diverse areas

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